

Research Note

Endoparasites of Western Slimy Salamanders, *Plethodon albagula* (Caudata: Plethodontidae), from Arkansas

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ABSTRACT: Thirty-seven western slimy salamanders, *Plethodon albagula* Grobman, 1944, collected between December 1988 and March 1992 from 10 counties of Arkansas, were examined for endoparasites. Fourteen (38%) were infected with 1 or more parasites: 2 (5%) with *Cepedietta michiganensis* (Woodhead, 1928) Corliss, de Puytorac, and Lom, 1965, 4 (11%) with an isosporan, 10 (27%) with *Cylindrotaenia americana* Jewell, 1916, 4 (11%) with *Batracholandros salamandrae* (Schad, 1960) Petter and Quentin, 1976, and 1 (3%) with an acanthocephalan cystacanth. In addition, 3 (8%) salamanders harbored an intraerythrocytic inclusion, *Cytamoeba bactivera* Labbé, 1894, thought by some to represent a protozoan of undetermined taxonomic status. This note represents only the second time an isosporan has been reported from salamanders of the world. With the exception of *C. michiganensis*, new host and distributional records are documented for these parasites of *P. albagula*.

KEY WORDS: *Isospora* sp., *Cylindrotaenia americana*, *Plethodon albagula*, Plethodontidae, Caudata, *Batracholandros salamandrae*, acanthocephalan cystacanth, *Cepedietta michiganensis*, *Cytamoeba bactivera*.

The western slimy salamander, *Plethodon albagula* Grobman, 1944, is a large plethodontid that ranges from southern Missouri southward through Arkansas and eastern Oklahoma; disjunct populations occur on the Balcones Escarpment of southcentral Texas (Dixon, 1987; Conant and Collins, 1991). This taxon was once recognized as a subspecies of the northern slimy salamander, *P. glutinosus* (Green, 1818), but has been distinguished biochemically from it as well as 14 other species of the complex (Highton et al., 1989). Although much is known about parasites of eastern members of the *P. glutinosus* complex (Rankin, 1937a, b; Fischthal, 1955; Cheng, 1958, 1960; Powders, 1970; Dunbar and Moore, 1979; and others), little is known regarding parasites of *P. glutinosus*-like salamanders found west of the Mississippi River. Byrd (1937) and Rabalais (1970) reported *Brachycoelium salamandrae* (Frölich, 1789) Dujardin, 1845, from *P. glutinosus* in Louisiana. Winter et

al. (1986) found the protozoan *Cepedietta michiganensis* (Woodhead, 1928) Corliss, de Puytorac, and Lom, 1965, and unidentified immature oxyuroids in a small sample of *P. glutinosus* (= *albagula*) from Arkansas. To our knowledge, nothing else has been published on its parasites. Herein, we report several endoparasites from *P. albagula*.

Between December 1988 and March 1992, 37 juvenile and adult ($\bar{x} \pm \text{SEM}$ snout–vent length [SVL] = 53.9 ± 0.2 , range 23–86 mm) *P. albagula* were collected by hand from the following locations (sample sizes in parentheses): Garland (7), Grant (6), Jackson (1), Newton (6), Perry (2), Polk (2), Pope (2), Saline (1), Stone (7), and White (3) counties of Arkansas and examined for endoparasites. Methods for salamander necropsy, coccidial isolation, and preparation and staining of blood smears and helminths follow McAllister and Upton (1987). Voucher specimens of salamanders are deposited in the Arkansas State University Museum of Zoology (ASUMZ 13136–37, 15462–67, 18019–21, 18273–75, 18277–79, and 18371–79). Specimens of parasites are deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705, as follows: *Cepedietta michiganensis* (USNM 82341), *Cylindrotaenia americana* (USNM 82217), *Batracholandros salamandrae* (USNM 82343), and acanthocephalan cystacanth (USNM 82342).

Fourteen (38%) of the *P. albagula* were infected, including 2 (5%) with *Cepedietta michiganensis*, 4 (11%) with an *Isospora* sp., 10 (27%) with *Cylindrotaenia americana* (Jewell, 1916), 4 (11%) with *Batracholandros salamandrae* (Schad, 1960) Petter and Quentin, 1976, and 1 (3%) with an acanthocephalan cystacanth. In addition, 3 (8%) salamanders harbored *Cytamoeba bactivera* Labbé, 1894.

Heavy infections of the astomatous ciliate *Cepedietta michiganensis* were found in the gall

bladder and small intestine of 2 adult *P. albagula* (male, 66 mm SVL, ASUMZ 18375; female, 78 mm SVL, ASUMZ 18371) collected in March 1992 from Grant and Garland counties, respectively. Winter et al. (1986) reported this ciliate from a single *P. albagula* from the western Ouachita Mountains of Arkansas. In addition, these same authors reported *C. michiganensis* from *Plethodon fourchensis* and *P. ouachitae*. There appears to be little host specificity for *C. michiganensis*, as the following ambystomatid and plethodontid salamanders have also been reported as hosts: *Ambystoma jeffersonianum*, *A. opacum*, *Desmognathus fuscus*, *D. monticola*, *Eurycea bislineata*, *E. longicauda*, *Hemidactylium scutatum*, *P. cinereus*, *P. jordani*, *P. glutinosus*, and *Pseudotriton montanus* (see Powders, 1967).

The 4 salamanders passing isosporan oocysts in the feces were collected in May 1989 and March 1992 from Pope, Grant, and Garland counties. Unfortunately, not enough oocysts completed sporulation to determine specific identification of the coccidian. Doran (1953) described *I. jeffersonianum* from the Jefferson salamander, *Ambystoma jeffersonianum* (Green, 1827) in north-central (Bemidji, Beltrami County) Minnesota; however, *A. jeffersonianum* is not known to occur in Minnesota (Conant and Collins, 1991). The type host is most likely the blue-spotted salamander, *A. laterale*, or a hybrid of the *A. laterale-jeffersonianum* complex (see Lowcock et al., 1987). Ambystomatids and plethodontids belong to separate salamander families and are unrelated phylogenetically; therefore, it is doubtful the isosporan reported herein is the same species reported from *A. jeffersonianum*. Thus, additional specimens will need to be recovered in order to describe the new species.

A total of 51 *C. americana* (mean intensity = 5.1, range 1–15) was recovered from the small intestine of 10 *P. albagula* (5 males, 5 females, 66.3 ± 3.8 , 44–86 mm SVL, ASUMZ 18019–21, 18371–75, 18378–79) collected in December 1991 and March 1992 from Garland, Grant, and White counties. McAllister (1991) provided a summation of the amphibians and reptiles of the world reported to be hosts of *C. americana*. In North America, the parasite has been found in various hosts from 17 states ranging from Washington, Oregon, and California east to Maine and south to Florida and Texas. Of the 9 species of salamanders listed as hosts, 8 are plethodontids, including the related *P. glutinosus* from eastern

Tennessee (Dunbar and Moore, 1979). Winter et al. (1986) reported unknown nematotaeniids from *P. caddoensis*, *P. fourchensis*, *P. ouachitae*, *P. serratus*, and *Desmognathus brimleyorum* from western Arkansas, although none of the 5 *P. albagula* they examined was infected with cestodes. Thus, *P. albagula* represents a new host, and Arkansas a new locality, for *C. americana*.

Sixteen oxyurid nematodes, *Batracholandros salamandrae* (mean intensity = 4.0 ± 1.4 , range 3–6), were found in the rectum of 4 *P. albagula* (2 males, 2 females, 64.0 ± 7.2 , 44–78 mm SVL, ASUMZ 19371, 18373–75) collected during March 1992 from Garland, Grant, and Stone counties. This parasite was originally described from *Aneides hardii* in New Mexico (Schad, 1960). Other salamander hosts include *P. neomexicanus* from New Mexico (Panitz, 1967), *P. elongatus*, *P. stormi*, and *P. vehiculum* from Oregon (Panitz, 1969), and *D. ochrophaeus*, *E. bislineata*, *P. glutinosus*, *P. richmondi*, and *P. ruber* from Tennessee (Dunbar and Moore, 1979). The related *Batracholandros magnavulvaris* (Rankin, 1937) Petter and Quentin, 1976, was reported from *P. glutinosus* from North Carolina (Rankin, 1937b) and, although not yet found in *P. albagula*, was reported from 5 other salamanders in Arkansas (Winter et al., 1986).

A single acanthocephalan cystacanth was recovered from the mesenteries of an adult female *P. albagula* (68 mm SVL, ASUMZ 18374) collected in March 1992 from Stone County. Cysts of *Acanthocephalus acutulus* Van Cleave, 1931, have been reported from *P. glutinosus* as well as numerous other salamanders from North Carolina (Rankin, 1937a).

Blood smears of 3 adult salamanders (2 males, 1 female, 66–75 mm SVL, ASUMZ 18375, 18378–79) revealed the intraerythrocytic organism *Cyrtamoeba bactivera*. Rankin (1937a) reported *C. bactivera* from *P. glutinosus* in North Carolina as well as *Notophthalmus viridescens*, *D. fuscus*, *D. phoca*, *D. quadramaculatus*, *P. ruber*, *E. guttolineata*, *A. maculatum*, *A. opacum*, and *P. cinereus*. In addition, Lehmann (1961) reported on the morphology and prevalence of *C. bactivera* in salamanders from California.

The taxonomic status of *C. bactivera* is currently unknown. Ayala (1978) considered *C. bactivera* to be a bacterium or virus, whereas cytochemical studies by de Sousa and Freire (1975) suggested it may actually represent a rickettsial agent or chlamydian. More recently, Bovee (1985) recognized this organism as belonging to the sub-

phylum Sarcodina, class Lobosea, family Entamoebidae.

In summary, this note represents only the second time an isosporan has been reported from salamanders of the world and, with the exception of *C. michiganensis*, new host and distributional records are documented for other parasites of *P. albagula*. It is not surprising that the majority of parasites reported herein for *P. albagula* are shared with *P. glutinosus*, given the 2 hosts are closely related phylogenetically and inasmuch all show little host specificity.

We thank J. Robinette, D. W. Saugey, J. D. Wilhide, and members of the 1991 Natural History and 1992 Herpetology classes at ASU for assistance in collecting. We also thank the Arkansas Game and Fish Commission for Scientific Collecting Permits Nos. 775 and 831 to C.T.M. and S.E.T., respectively.

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